

The Design of an Intelligent Community Portal for Diabetes Patient

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Abstract – Community services are among the important business aspect to strengthen the profit and desired between industries and social responsibility alike. Therefore, there is a need for a competitive company to gain trust and loyalty from their potential consumer. This project utilized knowledge based technology to address the need of diabetes patient to improvise their quality of life. Based on the case study done at B Braun Medical (M) Industries Sdn. Bhd., the project offers an ample space of interaction between the company and diabetic community via World Wide Web.

Index Terms- Community Portal, Diabetes, Expert System and Post Treatment Care.

I. Introduction

Community portal is a very popular as it revolutionizes the way of doing social responsibility community services among industry. Portals, as the name implies provide real benefit to the community alike by unlocking the information. This technology appears to be the one stop solution to information booming created by the World Wide Web. Generally, the objective of this portal is to design and develop interactive diabetes patient community web portal for B Braun Medical Industries Sdn. Bhd. Specifically, the objective of this project are:

- ? To provide information about advanced treatments and to improve their access to these treatments or products.

- ? To create interactive and collaborative environments both for diabetes patient community (especially Type II) and B.Braun through information exchange, products promotion, health care and life styles supports.
- ? To create online diabetes community for the exchange and support awareness.
- ? To support the medical community in their effort to eliminate the risk of diabetes.

II. Diabetes Mellitus

Diabetes Mellitus, often referred to as diabetes is a condition where is either a lack of insulin or failure of insulin to act normally, leading to a chronically high level of blood glucose [1]. There are two major types of diabetes mellitus, namely as Type I and Type II. Diabetes Type I refers to Insulin Dependent Diabetes Mellitus (IDDM), which occurs mainly in young patients (before 25) often with a sudden onset of symptoms. In Type I Diabetes there is an acute lack of insulin due to the destruction of the insulin producing beta cells in the pancreas. The exact cause is still unknown but it is believed to be caused by an auto-immune process (i.e.: destruction of self by antibodies).

Diabetes Type II or Non-Insulin Dependent Diabetes Mellitus (NIDDM) occurs when the produced insulin is in insufficient quantity or not effective. This resistance to insulin action is due to genetic reasons as well as environmental factors such as weight gain and sedentary

lifestyle [2]. This is the most common type of diabetes which constitutes over 90 percent of all cases of diabetes mellitus. Type II mostly occurs in overweight adults over 40 but in Asia the onset of system is often gradual and diagnosis is often made after the patient has developed some of the long term complication of diabetes.

III. Intelligent Knowledge Based System

Knowledge based (KB) system is a system that uses human knowledge captured in a computer to solve problems that ordinarily require human expertise [3]. Basically, KB systems are composed of two major parts; the development environment and the consultation environment. The development environment is used by the developer to build the components and put knowledge into the knowledge base. The consultation environment is used by a non-expert to obtain expert knowledge and advice.

The three major component components that appear virtually in every KB system are the knowledge base, inference engine and user interface. Knowledge base contains the knowledge necessary for understanding, formulating and solving problems. Inference engine is the brain of KB system. It also known as control structure or rule interpreter for problem or agenda solved. User interface provides interactive communication between the user and the computer.

IV. The Design and Implementation

A characteristic of knowledge based system design is that it is a highly iterative process. A small amount of knowledge is first obtained from the expert, encoded into the system, and then tested. Test results are used to uncover deficiencies in the system and become the focus for additional sessions with the expert [4]. This cyclic process continues throughout the development stage as the system's knowledge grows.

The rules used were structured in three parts (in propositional logic) [4];

IF <step> AND <heuristic> THEN <action>

The “step” part is used to control when the rule should be considered. While “heuristic” part is knowledge in the form of preconditions that must be met before rule can fire. Then “action”

part changes the present state of the design or switches control to other tasks or steps. There are six major tasks were implemented to developed the portal.

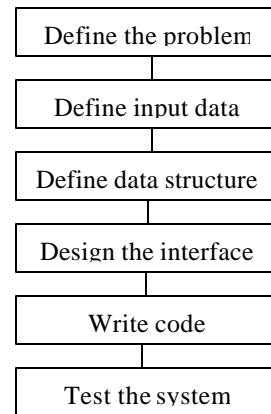


Fig. 1: Phases in KB System Development

The system was developed using Cold Fusion, MS Access, Macromedia Flash and SWISH. The portal architecture can be conceptually subdivided into five main modules. These modules are (refer Fig 2.0):

- ? User Access and Registration
- ? Diabetic Health Care Advisor
- ? Diabetic Product Diagnostic
- ? Community Message Board

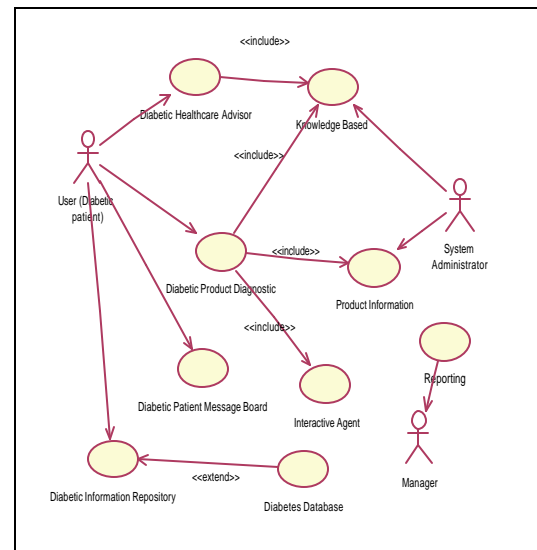


Fig 2.0: The Use Case Diagram for the Portal

A. User Access and Registration

The user access and registration module is the module that stores and validates user profiles and

portal access. Several important questions will be asked, such as diabetes types, medication history and some related information. These particular serves as references for allergies, life style support and as well as relevant products.

B. Diabetic Health Care Advisor

This module utilizes the capability of knowledge based system to advise appropriate life style for diabetes patient. The advice was derived from analysis done through five major components, namely as social life, working conditions, medication, food & beverage and activities. These components were evaluated given user profiles. The example of rules implementation is:

Rule 1 (Initial Rule for Activities):

*If you're thinking to do an exercise
Then test your blood level first.*

Rule 2 (Activities):

*If Blood Sugar count < 80 mmol/l
And Light Exercises are needed
Then should take any at least one citrus
fruit prior exercise session.*

Rule 3 (Activities):

*If Blood Sugar count < 80 mmol/l
And Strenuous Exercises are needed
Then should take any at least one citrus
fruit, a glass of milk and meat/dairy
product prior exercise session.*

The initial rule will trigger the goal based on suitable condition. Below is the example of an inference network for activities rules.

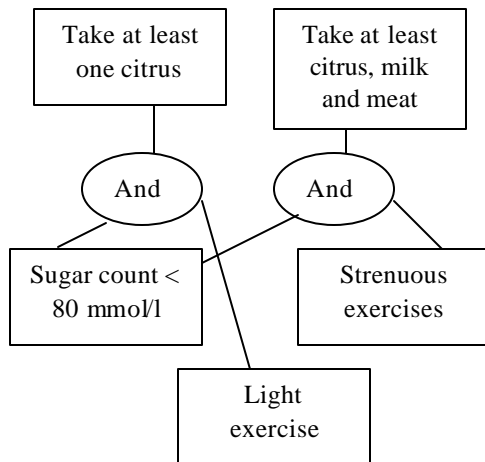


Fig. 2: The Activities Advices Inference Network

The most appropriate action is triggered for proper lifestyle suggestion. Thus, the user will be provided such option based on their need.

C. Diabetic Product Diagnostic

This module main purpose is to assist a person's need for diabetic support products.

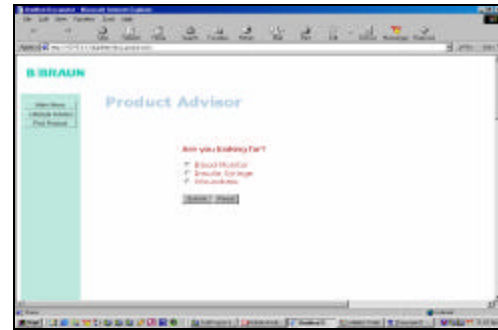


Fig. 3: The Screenshot of Diabetic Product Diagnostic Module

These products are among holistic therapy offered by B.Braun Medical Industries. The diabetic care is one of these therapeutic areas. It offers a comprehensive care and not only leaves the choice patient of therapy but freedom in a new way [5]. Living with diabetes means to maintain a good metabolic balance, thus preventing secondary diseases and ensuring the quality of life.

The module works on rules matching in knowledge base. Among the products stored in the knowledge based are:

- ? Blood glucose and pressure adjustment measurement kit.
- ? Secondary and accompanying diseases treatment kit.

Below is the sample of implemented rules in the module:

Rule 1 (Blood Monitoring Devices):

*If product searched is blood monitoring devices
Then evaluate type of monitoring*

Rule 2 (Blood Monitoring Devices):

*If type of monitoring is blood glucose count
And blood pressure measurement
Then suggest Activita Combi with Lower Arm Cuff*

Rule 3 (Blood Monitoring Devices):

If type of monitoring is blood glucose count

Then suggest Omnitest Sensor Blood Glucose Meter.

There are three types of support products offered in this module, namely as blood monitoring, syringes and treatment & clinical products.

D. Community Message Board

The community message board addresses the knowledge sharing capability. There are seven functions offered through this module. These are announcement section, article sharing, photos galleries, discussion board, personal message, polling and administration. At the announcement section, users and administrator are allowed to announce any related news to other users. While, article sharing, photo galleries, discussion board, personal message and discussion board provides collaborative interaction for information exchange over similar or personal interest among diabetes patient. Thus, it will create a virtual community with greatest intention to help and support their normal life as diabetes patient.



Fig. 4: The Screenshot for Community Message Board Module.

Polling section is another function offered by message board. Upon several topics chosen, for example the major needs for diabetes patient. The result from this poll can be used to develop marketing strategies for respective companies. In our case, B Braun Medical Industries (M) Sdn. Bhd. will be provided with such input for their market segmentation and planning.

V. Conclusion and Future Developments

In this paper, an intelligent community portal for diabetes patients has been successfully designed. There are four modules were developed to support collaboration and interaction for portal users. The topics covered are lifestyle support, diabetic care product, collaborative community board and post-treatment approach. Our work presented here directs to some prospects for future research. One is to investigate the capability of knowledge based techniques can be used to provide expert advice in community portal for diabetes patient. As a conclusion, community portal for diabetes patient should be occupied with support modules to provide a better insight for diabetes patient.

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